

## Claims

- [c1] 1.A communications system for a medical imaging system, comprising:  
a slave node for each of a plurality of components of the medical imaging system;  
a master node coupled to each slave node via a network;  
a uniform communications protocol for communications between the master node and each slave node.
- [c2] 2.The communications system of claim 1, wherein the network comprises a controller area network bus.
- [c3] 3.The communications system of claim 2, wherein the network comprises controller area network high and low communications links.
- [c4] 4.The communications system of claim 1, wherein the network comprises a safety loopback communications link.
- [c5] 5.The communications system of claim 1, wherein the uniform communications protocol comprises a controller area network open protocol.
- [c6] 6.The communications system of claim 1, wherein the plurality of components comprise image acquisition components of the medical imaging system.
- [c7] 7.The communications system of claim 1, wherein the plurality of components comprise image processing components of the medical imaging system.
- [c8] 8.The communications system of claim 1, wherein the plurality of components comprise user interaction components of the medical imaging system.
- [c9] 9.The communications system of claim 1, wherein the plurality of components comprise monitoring components of the medical imaging system.
- [c10] 10.The communications system of claim 1, wherein the master node is disposed on control circuitry.
- [c11] 11.The communications system of claim 1, wherein the master node comprises a fault sensing system to identify component faults at the slave nodes.

- [c12] 12.The communications system of claim 11, wherein the fault sensing system comprises a message-response system having a critical response time.
- [c13] 13.The communications system of claim 12, wherein the message-response system comprises a periodic monitoring message, which comprises a response request.
- [c14] 14.The communications system of claim 11, wherein the fault sensing system comprises a safe mode backup system for the plurality of components.
- [c15] 15.The communications system of claim 1, wherein the master node comprises a component control system having a timed-component-response system.
- [c16] 16.The communications system of claim 1, wherein at least one of the slave nodes comprises an emergency status messaging module.
- [c17] 17.The communications system of claim 1, wherein at least one of the slave nodes comprises an asynchronous data communications module adapted to transfer data periodically from the slave node to the master node without the master node querying for the data.
- [c18] 18.The communications system of claim 1, wherein at least one of the slave nodes comprises a synchronous data communications module adapted to transfer data from the slave node to the master node in response to the master node querying for the data.
- [c19] 19.The communications system of claim 1, wherein at least one of the slave nodes comprises a fault sensing system to identify component faults at the slave node.
- [c20] 20.The communications system of claim 1, wherein the uniform communications protocol comprises a cyclic redundancy check module adapted to ensure data integrity on the network.
- [c21] 21.A medical imaging system, comprising:  
a plurality of medical imaging components having network slave nodes;  
control circuitry having a network master node for the network slave nodes; and

a uniform communications protocol for network communications between the network master node and the network slave nodes.

- [c22] 22.The medical imaging system of claim 21, wherein the network master node and the network slave nodes are communicatively coupled via a controller area network.
- [c23] 23.The medical imaging system of claim 22, wherein the controller area network comprises high and low communications links.
- [c24] 24.The medical imaging system of claim 22, wherein the network comprises a safety loopback communications link extending between the control circuitry and the plurality of medical imaging components.
- [c25] 25.The medical imaging system of claim 21, wherein the uniform communications protocol comprises a controller area network open protocol.
- [c26] 26.The medical imaging system of claim 21, wherein the uniform communications protocol comprises an event-driven communications module.
- [c27] 27.The medical imaging system of claim 26, wherein the event-driven communications module comprises a component status notification system.
- [c28] 28.The medical imaging system of claim 21, wherein the uniform communications protocol comprises a periodic communications module.
- [c29] 29.The medical imaging system of claim 28, wherein the periodic communications module comprises a message-response monitoring system.
- [c30] 30.The medical imaging system of claim 21, wherein the network master node comprises a fault sensing system to identify component faults at the network slave nodes.
- [c31] 31.The medical imaging system of claim 21, wherein the network master node comprises a component control system having a timed-component-response system.
- [c32] 32.The medical imaging system of claim 21, wherein at least one of the network

slave nodes comprises an emergency status notification module.

[c33] 33.The medical imaging system of claim 21, wherein at least one of the network slave nodes comprises an asynchronous data communications module adapted to transfer data periodically from the network slave node to the network master node without the network master node querying for the data.

[c34] 34.The medical imaging system of claim 21, wherein at least one of the network slave nodes comprises a synchronous data communications module adapted to transfer data from the network slave node to the network master node in response to the network master node querying for the data.

[c35] 35.The medical imaging system of claim 21, wherein the uniform communications protocol comprises a cyclic redundancy check module adapted to ensure data integrity on the network.

[c36] 36.A method for communicating between components of a medical imaging system, comprising the acts of:  
managing the medical imaging system at a master node of a network having a slave node for each of a plurality of medical imaging components; and  
communicating between the master and slave nodes using a uniform communications protocol.

[c37] 37.The method of claim 36, wherein the act of managing the medical imaging system comprises the act of operating the medical imaging system.

[c38] 38.The method of claim 36, wherein the act of managing the medical imaging system comprises the act of monitoring operational characteristics of the plurality of medical imaging components.

[c39] 39.The method of claim 36, wherein the act of managing the medical imaging system comprises the act of efficiently controlling the plurality of medical imaging components using the uniform communications protocol.

[c40] 40.The method of claim 36, wherein the act of communicating comprises the act of providing communications compatibility among the plurality of medical imaging components.

- [c41] 41.The method of claim 36, wherein the act of communicating comprises the act of transmitting messages over a controller area network bus.
- [c42] 42.The method of claim 36, wherein the act of communicating comprises the act of networking the master and slave nodes with a controller area network open protocol.
- [c43] 43.The method of claim 36, wherein the act of communicating comprises the act of transmitting data over at least one of high and low communications links.
- [c44] 44.The method of claim 36, wherein the act of communicating comprises the act of transmitting an event-driven message.
- [c45] 45.The method of claim 44, wherein the act of transmitting the event-driven message comprises the act of notifying the master node of a component status at one of the slave nodes.
- [c46] 46.The method of claim 44, wherein the act of transmitting the event-driven message comprises the act of notifying the master node of a component fault at one of the slave nodes.
- [c47] 47.The method of claim 36, wherein the act of communicating comprises the act of transmitting a periodic status message.
- [c48] 48.The method of claim 47, wherein the act of transmitting the periodic status message comprises the act of sending a timed-response request to at least one of the slave nodes.
- [c49] 49.The method of claim 48, wherein the act of transmitting the periodic status message comprises the act of changing the slave node to a safe state if the slave node does not respond to the timed-response request as requested.
- [c50] 50.The method of claim 47, wherein the act of transmitting the periodic status message comprises the act of notifying the master node of an error if the slave node does not receive the periodic status message from the master node.
- [c51] 51.The method of claim 36, wherein the act of managing comprises the acts of: sending a command to one of the slave nodes; and

requesting a command verification from the slave node.

[c52] 52.The method of claim 51, wherein the act of requesting the command verification comprises the act of setting a maximum response time for the slave node to respond to the requested command verification.

[c53] 53.A medical diagnostic system, comprising:  
uniform communications means for communicating between components of the medical diagnostic system; and  
message means for safely operating the medical diagnostic system.

[c54] 54.The medical diagnostic system of claim 53, comprising image acquisition means for the medical diagnostic system.

[c55] 55.The medical diagnostic system of claim 53, comprising user interaction means for the medical diagnostic system.

[c56] 56.A method for generating a medical diagnostic image, comprising the acts of:  
operating the medical imaging system at a master node of a network having a slave node for each of a plurality of medical imaging components;  
communicating between the master and slave nodes using a uniform communications protocol; and  
generating the medical diagnostic image.

[c57] 57.The method of claim 56, wherein the act of operating the medical imaging system comprises the act of monitoring operational characteristics of the plurality of medical imaging components.

[c58] 58.The method of claim 56, wherein the act of operating the medical imaging system comprises the act of efficiently controlling the plurality of medical imaging components using the uniform communications protocol.

[c59] 59.The method of claim 56, wherein the act of communicating comprises the act of providing communications compatibility among the plurality of medical imaging components.

[c60] 60.The method of claim 56, wherein the act of communicating comprises the

act of transmitting messages over a controller area network bus.

- [c61] 61.The method of claim 56, wherein the act of communicating comprises the act of networking the master and slave nodes with a controller area network open protocol.
- [c62] 62.The method of claim 56, wherein the act of communicating comprises the act of transmitting data over at least one of high and low communications links.
- [c63] 63.The method of claim 57, wherein the act of communicating comprises the act of transmitting an event-driven message.
- [c64] 64.The method of claim 63, wherein the act of transmitting the event-driven message comprises the act of notifying the master node of a component status at one of the slave nodes.
- [c65] 65.The method of claim 63, wherein the act of transmitting the event-driven message comprises the act of notifying the master node of a component fault at one of the slave nodes.
- [c66] 66.The method of claim 56, wherein the act of communicating comprises the act of transmitting a periodic status message.
- [c67] 67.The method of claim 66, wherein the act of transmitting the periodic status message comprises the act of sending a timed-response request to at least one of the slave nodes.
- [c68] 68.The method of claim 67, wherein the act of transmitting the periodic status message comprises the act of changing the slave node to a safe state if the slave node does not respond to the timed-response request as requested.
- [c69] 69.The method of claim 66, wherein the act of transmitting the periodic status message comprises the act of notifying the master node of an error if the slave node does not receive the periodic status message from the master node.
- [c70] 70.The method of claim 56, wherein the act of operating comprises the acts of: sending a command to one of the slave nodes; and requesting a command verification from the slave node.

- [c71] 71.The method of claim 70, wherein the act of requesting the command verification comprises the act of setting a maximum response time for the slave node to respond to the requested command verification.
- [c72] 72.A computer program for a medical diagnostic system, comprising:  
a tangible medium configured to support machine-readable code; and  
machine-readable code supported on the medium and comprising a network-based operational-management system for the medical diagnostic system, the network-based operational- management system comprising:  
operational-management code adapted to manage the medical imaging system at a master node of a network having a slave node for each of a plurality of medical imaging components; and  
communications code adapted to facilitate communications between the master and slave nodes using a uniform communications protocol.
- [c73] 73.The computer program of claim 72, wherein the operational-management code comprises component monitoring code adapted to monitor operational characteristics of the plurality of medical imaging components.
- [c74] 74.The computer program of claim 72, wherein operational-management code and the communications code comprise controller area network code.
- [c75] 75.The computer program of claim 72, wherein operational-management code and the communications code comprise controller area network open code.
- [c76] 76.The computer program of claim 72, wherein the machine-readable code comprises event-driven communications code.
- [c77] 77.The computer program of claim 76, wherein the even-driven communications code comprises status notification code adapted to notify the master node of a component status at one of the slave nodes.
- [c78] 78.The computer program of claim 77, wherein status notification code comprises fault notification code adapted to notify the master node of a component fault at one of the slave nodes.
- [c79] 79.The computer program of claim 72, wherein the machine-readable code



comprises periodic communications code.

[c80] 80.The computer program of claim 79, wherein periodic communications code comprises timed status-check code adapted to transmit a timed-response request to at least one of the slave nodes.

[c81] 81.The computer program of claim 80, wherein timed status-check code comprises error-handling code for a problematic component at the at least one slave node.

[c82] 82.The computer program of claim 81, wherein the error-handling code comprises mode-changing code adapted to change the at least one slave node to a safe state if the at least one slave node does not respond to the timed-response request as requested.

[c83] 83.The computer program of claim 80, wherein the timed status-check code comprises error-notification code adapted to notify the master node of an error if the at least one slave node does not receive the periodic status message from the master node.

[c84] 84.The computer program of claim 72, wherein the operational-management code comprises:  
component control code adapted to transmit a desired command to one of the slave nodes; and  
command verification code adapted to request a command verification from the slave node.